The Health of Puget Sound—Measures of Puget Sound's Environmental and Natural Resource Health

Kevin Anderson
Puget Sound Water Quality Action Team

Introduction

In 1996, the Washington Legislature directed the Puget Sound Water Quality Action Team to develop and track measures of the health of Puget Sound's water quality and natural resources. This report outlines the method used by the Action Team to develop them. It also summarizes the Sound-wide status and trends of each. Performance measures will be used to assess how well the Puget Sound Water Quality Management Plan protects and restores the biological health and diversity of Puget Sound. Future activities will focus on using these measures to build constituencies, educate citizens about Puget Sound's environment and to set resource management program priorities.

Legislative Mandate and Guidance

The Puget Sound Water Quality Protection Act of 1996 directed the Puget Sound Water Quality Action Team to develop performance measures. The governor and the legislature will use these measures to assess the effectiveness of the Puget Sound Plan.

> In consultation with state agencies, local and tribal governments, and other public and private interests, the action team shall develop and track quantifiable performance measures that can be used by the governor and the legislature to assess the effectiveness over time of programs and actions initiated under the plan to improve and protect Puget Sound water quality and biological resources. The performance measures shall be developed by June 30, 1997. The performance measures shall include, but not be limited to a methodology to track the progress of: Fish and wildlife habitat; sites with sediment contamination; wetlands; shellfish beds; and other key measures of Puget Sound health. State agencies shall assist the action team in the development and tracking of these performance measures. The performance measures may be limited to a selected geographic area. (RCW 90.71.060)

The Puget Sound Action Team will use these measures to help set water quality and resource protection priorities in developing the state's biennial Puget Sound work plan and budget. Performance measures will be used to inform the general public and policy makers about the health of the Sound. Future work may focus using measures to inform the development of watershed assessments and plans.

Objectives

To meet the requirements of the Act, the Puget Sound Water Quality Action Team chair outlined the following broad objectives for developing Puget Sound health measures:

- Use an advisory group to develop and recommend measures.
- Characterize environmental results of programs, rather than program activities.
- Keep the list of performance measures short.
- Develop measures from data that agencies already have or plan to obtain and rely on those agencies for data analysis.
- Identify performance measures for which data is not currently available.
- Select measures to serve a variety of audiences, including the governor and legislature.

Methods and General Design Considerations

For the purposes of this project, the Action Team used the following "performance measures" terminology. Performance measures are a thumbnail status report on the health of the environment or natural resources and provide an early warning of problems. These measures do not explain the causes of problems. They may be reported in terms of reference points, such as benchmarks or goals, or as positive or negative trends.

The Action Team convened an advisory group composed of tribal, state and local governments, and business and environmental interests to recommend performance measures, data collection strategies and to identify gaps in both. The group met several times.

The advisory group identified a set of real-world, frequently asked questions relevant to Puget Sound's environmental health. Performance measures were identified around these questions. They are designed to resonate with the general public. The real-world questions addressed the following environmental and resource management topics: aquatic habitat, fish and wildlife populations and habitat, exotic species, toxic discharges, oil spills, wetlands, shellfish and contaminated sediment sites. These topics are identified in the:

- Puget Sound Water Quality Protection Act (RCW 90.71.060);
- Puget Sound Water Quality Management Plan; and
- Marine Science Panel's Shared Marine Waters of British Columbia and Washington.

To ensure coordination with other projects, the Action Team support staff and the advisory group reviewed ongoing environmental indicator projects and potential measures related to each environmental and resource management topic. These projects included the Puget Sound Ambient Monitoring Program, the U.S. Environmental Protection Agency, Washington State Department of Ecology, British Columbia's Ministry of Environment, Lands and Parks and other projects. All potential measures, from these projects and from others identified by the group, were ranked using the following broad criteria:

- Value to the public;
- Relevance to Puget Sound environmental management;
- Technical merit; and
- Practicality.

Top ranked measures were tested by small groups of interagency specialists. The tests showed the relationship between the health of the environment and program actions for each topic area; assessed data availability and refined selected performance measures.

Recommended Performance Measures

The Puget Sound Water Quality Action Team adopted the recommended performance measures listed in Table 1.

Results

The Action Team prepared a Sound-wide status and trend analysis of each Puget Sound health measure. A synopsis of these trends is included in Table 2: Puget Sound Environmental Trends. Table 3: Data Sources summarizes data sources used to populate each measure. Data from various sources were used in this analysis. Some measures have insufficient data to show trends over time. These are listed as "baseline" measures and provide a reference against which future changes can be assessed.

To the extent possible, each measure will be reported on both a Sound-wide and watershed level. Performance measures will also be reviewed annually and, when appropriate, updated and reported in a variety of formats.

Table 1. Puget Sound performance measures

Question	Performance Measure
1) Are fish and wildlife populations increasing or decreasing?	• Status of key species: scoter, herring, wild salmon and harbor seals.
2) Is the area of contaminated sediments increasing or decreasing?	• Area of Puget Sound sediments known to be contaminated. • Area of Puget Sound sediments restored.
3) Are toxins in the marine environment increasing or decreasing?	• Metals and organic contaminants in mussels and English sole.
4) Are safe shellfish harvest areas increasing or decreasing?	• Change in acreage of classified shellfish growing areas based on sanitary conditions
5) Is water quality for recreation improving or declining?	• Levels of fecal coliform bacteria at selected nearshore and river sites.
6) Are the size and frequency of oil spills increasing or decreasing?	• Frequency and volume of oil spills from vessels and shore-based facilities.
7) Is functional fish and wildlife habitat increasing or decreasing?	• Area of habitat inaccessible to salmon because of human-made barriers. • Additional fish and wildlife habitat measures will be identified.
8) Are functional wetlands increasing or decreasing?	• Wetland measures will be identified. There is currently inadequate information to support Sound-wide reporting on wetlands measures.

Next Steps

The following are the next steps related to the Puget Sound performance measures project.

1) Fresh and Marine Water Wetlands and Fish and Wildlife Habitat Measures: The Action Team recognized that there was not enough information to support Sound-wide reporting on wetlands and habitat measures. They directed staff to investigate and recommend measures and data collection strategies for determining long-term trends in the quality and quantity of fresh and marine water wetlands and habitat.

Table 4 was developed with help from an interagency work group. These measures and potential data sources were presented to the Puget Sound Water Quality Action Team in February 1998. The Action Team directed staff to use these recommendations as the basis for developing measures and data collection strategies that are coordinated with ongoing salmon protection and restoration efforts.

2) Improve Coordination and Cooperation: Many government agencies and private groups are working on similar projects at different scales and within different time frames. Some of these projects have developed and use measures for water quality and biological resources in the Puget Sound basin. While some projects share common goals, there are numerous approaches to collecting and using measures.

The Action Team plans a one-day workshop to provide opportunities for government and private practitioners to network and cooperate on development and use of performance measures. The workshop will explore collaboration opportunities and discuss the uses of measures in management and for public education and involvement.

3) Publish and Update Performance Measures: The Action Team is in the process of publishing a report on the status and trends of each performance measure. The report will be written for public consumption. In addition, each performance measure will be reviewed annually. Updated status or trends information will be made available through supplemental publications or through the Action Team's newsletter and web page.

Table 2. Puget Sound environmental trends.

Performance Measure	Increasing	Declining	No change	Baseline	Significance
Are fish and wildlife populations increasing or decreasing?					
Pacific herring stocks				X	Of 18 stocks, 1 is critical, 3 are depressed.
Pacific herring populations		X			Steady declines since 1975, significant declines in 1996-'97.
Salmon and steelhead stocks				X	27% of the Sound's 209 stocks are critical or depressed.
Scoter populations		X			50% decline in population since 1979.
Harbor seal populations	X				6% annual increase in populations since 1975.
Are functional wetlands increasing or decreasing?					
Quality and quantity of marine and freshwater wetlands	**No data**				Measures and data collection strategy proposed.
Is functional fish and wildlife habitat increasing or decreasing?					
Habitat inaccessible to salmon because of man-made barriers				X	Potential habitat not available to coho: 59% in Dungeness/Elwha; 73% in Quilcene and 39% in the Stillaguamish watersheds.
Is the area of contaminated sediments increasing or decreasing?					
Contaminated sediments				X	13,845 acres surveyed: 5,083 fail sediment quality standards and 3,173 acres do not meet cleanup screening levels.
Restored sediments				X	49 contaminated sites (total 2,197 acres) targeted for cleanup.
Are areas where shellfish can be safely harvested increasing or decreasing?					
Commercial harvest areas			X		Area safe harvest remains unchanged since 1989.
Recreational harvest areas			X		Initially classified in 1994, other areas have since have been classified.
Is water quality for recreation improving or declining?					
Bacterial contamination levels in rivers			X		Rivers are degraded due to fecal bacteria pollution, they haven't improved or declined since 1983.
Are toxins in the marine environment increasing or decreasing?					
Metal and organic contaminants in mussels		X			Concentrations of mercury, copper, zinc, PCBs, or butyl tin in mussels have declined significantly at six of seven long-term stations.
Occurrence of liver lesions in English sole	X				2 of 6 stations show increases of lesions, while 4 stations show no trend.
Are the size and frequency of oil spills increasing or decreasing?					
Number and volume of spills		X			80% of large spills are heavy oils from land based facilities and pipelines; 70% of medium spills are from vessel fueling operations.

Table 3. Data sources used to populate each performance measure.

Performance Measure	Data Source
Pacific herring populations and stock status	Washington Department of Fish and Wildlife, 1997
Salmon and steelhead stock status	Washington Department of Fish and Wildlife, Salmon And Steelhead Stock Inventory, 1992
Diving duck (scoter) populations	Puget Sound Ambient Monitoring Program: Washington Department of Fish and Wildlife, 1997
Harbor seal populations	Puget Sound Ambient Monitoring Program: Washington Department of Fish and Wildlife, 1997
Marine and freshwater wetland quality and quantity	No data
Inaccessible salmon habitat due to man-made barriers	Northwest Indian Fisheries Commission: Salmon and Steelhead Habitat Inventory and Assessment Program, 1998
Contaminated sediments	Washington Department of Ecology, 1997
Bacterial contamination of rivers	Puget Sound Ambient Monitoring Program: Washington Department of Ecology, 1997
Metal and organic contaminants in mussels	National Atmospheric and Oceanographic Administration, 1997
Occurrence of liver lesions in English sole	Puget Sound Ambient Monitoring Program: Washington Department of Fish and Wildlife, 1997
Number and volume of spills	Washington Department of Ecology, 1997

TABLE 4: Recommended performance measures for Puget Sound freshwater and marine wetlands and fish and wildlife habitat.

Performance Measures	Data Sources
Change in linear miles of salmon habitat inaccessible due to man-made barriers	Continue salmon and steelhead Habitat Inventory and Assessment Program.
Change in the area of key nearshore habitat: salt marsh; kelp and eelgrass beds	Develop and use new methods under Puget Sound Ambient Monitoring Program (PSAMP) nearshore habitat inventory.
Change in the health of intertidal habitat	Develop and use new methods under PSAMP nearshore habitat inventory.
Change in the biological health of Puget Sound rivers	Expand Ecology's biological ambient monitoring program to track change over time.
Change in the area of wetlands and riparian habitat	Develop a new system to detect change in wetlands and riparian habitat through satellite image analysis.
Change in the length of armored shoreline	Use existing Washington Department of Fish and Wildlife Coastal Spill Response Inventory.

Conclusions

1. Performance measure data are readily available. Puget Sound Water Quality Action Team agencies and other agencies, such as the Northwest Indian Fisheries Commission and the National Atmospheric and Oceanographic Administration, maintain long-term and reliable environmental monitoring data bases.
2. There is inadequate data to track the status and trends in the quality and quantity of fresh and marine water wetlands and fish and wildlife habitat in the Puget Sound basin. The Action Team support staff will continue to work with interested agencies, tribal governments and environmental interests to recommend measures and data collection strategies for fresh and marine water wetlands and fish and wildlife habitat.
3. The Action Team support staff will coordinate and integrate the development of fresh and marine water wetlands and fish and wildlife habitat measures with ongoing salmon protection and restoration efforts.

4. A long-term objective of this project is to improve the use of Puget Sound performance measures. Specifically, the goal is to improve their use for building constituencies, for educating citizens about the environment, and for setting priorities to target resource management programs on critical resource issues. In order to ensure this happens, performance measure data should be reviewed annually. Updated information should be reported in various formats, including the agency's web site.
5. Use and acceptability of the Action Team performance measures by the greater Puget Sound community will require coordination and ongoing effort. The Action Team plans to promote networking opportunities aimed at improving cooperation and coordination among various levels of government and the use of performance measures for public education and involvement.
6. The Action Team support staff will continue to investigate ways to improve the usefulness of Puget Sound performance measures to local and regional agencies and other interests.
7. The Action Team will continue to use performance measures to help set priorities and actions for each biennial work plan and budget proposal. The Team will continue to use trend information as a way to track effectiveness of the Puget Sound Plan in protecting and restoring the biological health and diversity of Puget Sound.